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**THE INFORMATION SUPERHIGHWAY
AND ELECTRONIC COMMERCE:
EFFECTS OF ELECTRONIC MARKETS**

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August 1994

**CISR WP No. 273
Sloan WP No. 3725**

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The Information Superhighway and Electronic Commerce: Effects of Electronic Markets

SUMMARY

This paper examines how electronic markets may affect the evolution of the emerging national information infrastructure, popularly described as the information superhighway. Although not specifically discussed the conclusions reached seem applicable to the emerging global information infrastructure as well, albeit its development may be somewhat slower. It anticipates a rapid expansion of electronic market activity, as the national information infrastructure (NII) is connected to where the consumer lives, the home. When this happens (most likely over a ten year transition) significant changes in the economics of marketing channels, patterns of physical distribution, and the structure of distributor companies may also take place. Central to this evolution will be the way in which the "market choice box," the consumer's interface between the many electronic devices in the home (television, telephone, and computers), the information superhighway, and the vast variety of market choices, will be implemented.

Electronic markets, augmented by the capabilities of the market choice box, may profoundly affect those industry value chains that terminate with the consumer. The analysis presented here draws on previous writing on transaction costs and electronic markets and suggests that: 1) all intermediaries between the manufacturer and the consumer may be threatened, as the NII reaches out to the consumer; 2) profit margins may be substantially lowered and redistributed; 3) the consumer will thus have access to a broad choice of lower priced goods; and 4) there will be many opportunities to restrict market access to the potentially vast amount of commerce that will flow to the consumer. Although many of these potential areas of restricted access are being debated in public policy arenas, the market choice box, a technology component, may become a critical component of free access and thus needs public policy scrutiny.

RATIONALE: TRANSACTIONS AND BORDERLESS ORGANIZATIONS

It is becoming increasingly difficult to accurately delineate the borders of today's organizations. Does the border simply encircle the actual internal organizational

structure, or does it extend to include tight and strategic relationships with customers and suppliers? Does it extend to include other organizations where cooperative relationships are enjoyed?

Driven by information technology's ability to produce ever cheaper unit costs for coordination activities, organizations are implementing at an increasingly rapid rate new linkages for the way they relate to each other. These linkages take many forms, among them: electronic data integration, just-in-time manufacturing, electronic hierarchies and markets, strategic alliances, networked organizations, and others. These new organizational settings indicate an ongoing transformation of value chains due to technological change.

The national information infrastructure as proposed presents the strategy analyst with an idealized model of everything connecting to everything else, at an extremely high capacity of communications bandwidth, at relatively low user costs. This conceptual model, that can be analogized to Galileo's frictionless body, permits analysis, and to some extent observation about what will happen to organizational and industry value chains (i.e., the collection of companies involved in producing, distributing and selling a related set of products from raw material to the ultimate consumer, as illustrated in Figure 1), when the NII capabilities become real.

The analysis of transactions provides a framework for examining the potential changes in organizational and industry value chains. Chandler [1979], noted that "every coordinative activity that improves organizational efficiency, speeds up flow through the system, or permits a more intensive use of the factors of production, is likely to improve the performance of the economic system." Williamson [1981] similarly pointed out that "the modern corporation is to be understood as the product of a series of organizational innovations that have had the purpose and effect of economizing on transaction costs."

What was said about the corporation seems equally true for the industry value chain, where Michael Porter [Porter, 1990, pp. 42-43], who uses the terminology "value system" for industry value chain, notes that "Competitive advantage is increasingly a function of how well a company can manage this entire system." If it is true that the NII dramatically economizes costs of information and communications, i.e., coordination costs, this will result in fundamental restructure of entrepreneurial opportunities and roles within industry value chains.

Within a given value chain each business will search for transactions that provide advantage over its competitors, that will provide competitive differentiation that takes advantage of the new NII potentials. For example one or more of the organizations within an industry value chain may be bypassed when the NII provides the facilitating linkages for a new pattern of transactions. An Office of Technology Assessment report [1994, pp. 23] states that "Networking technologies can greatly reduce the costs entailed in exchange transactions. As these costs decline many business activities previously carried out within vertically integrated firms will be shifted to the market place. ... The network will in many instances serve as the market. When this occurs market structure will depend as much on network characteristics and the economies of networks as it does on relationships among firms".

In the following sections of the paper we will examine electronic markets, and the industry value chain from the perspective of transactions and transaction costs. We will present a model of the NII that identifies key technology elements and stakeholders. We will identify several highly leveraged opportunities for redefining industry value chains. Finally we will identify issues that executives and policy makers should focus on in the near term.

THE NATIONAL INFORMATION SUPERHIGHWAY: AN OVERVIEW

"Simply put, fiber to the home, school and business is an essential infrastructure for economic development in the Information Age of the 21st century, just as railroads were in the last century, and highways were in this century. As the economy shifted from agrarian-based to industrial-based, our ability to move goods via railroads at first, and highways later proved essential.

Now we are shifting toward a service-based economy in which the ability to transport information will prove essential."

So argued the Senate Commerce Committee in support of Information Infrastructure legislation [Senator Hollings 1990]. This argument has served as a cornerstone justification for rapidly moving activities, both legislative/regulatory and commercial as the National Information Infrastructure (NII) starts to take form [Gore, 1993].

While momentum towards the NII increases, many questions are being debated by the various stakeholders groups the NII should serve. What are the benefits of the infrastructure, and to whom do they flow? Is the NII moving goods, or moving ideas, or both? Can one extrapolate benefits from the railroad, highway, and aviation infrastructures where both physical goods and information goods (for example, mail, bills of lading, etc.) were transported to the NII, an infrastructure that only transports information goods, as early forms of the information infrastructure have done (e.g., the telegraph, the telephone)? Who are the direct and indirect beneficiaries of the "increased economic activity" presumed for the NII? We examine these questions from the context of electronic markets and the value system from the manufacturer to the consumer.

Vision and Scope:

Vice President Gore suggests that the vision of the infrastructure can be simply stated as the linkage of all information users with all information providers through some form of market mechanism.

"Anyone who wants to form a business to deliver information will have the means of reaching customers. And any person who wants information will be able to choose among competing information providers, at reasonable prices. That's what the future will look like -- say in 10 to 15 years." [Gore, 93]

What the Vice President has described is a vast amount of commerce and government/public affairs conducted through electronic markets, with the following general objectives:

- to improve the competitiveness of American industry.
- to improve access to educational, health and library services for all citizens.
- to improve access to government information for all citizens.

In the balance of this paper we examine industry value chains and electronic markets, their relationship to the NII, and the transformational effects they may have on the competitiveness of American industry. We do not include in this analysis how electronic markets can influence the other critical objectives of the NII.

Current State of the NII:

Today there is no integrated National Information Infrastructure. Rather, the current state can be best described as economic and public activity served by independent information infrastructures, (television, cable, telephone, wireless), all moving inexorably to interconnected digital services, to connect business, government and individuals at home. All information infrastructure providers as well as many information technology providers want to participate in the integration of the computer, the telephone, and the television in the home. Numerous mergers and strategic alliances have been formed on the assumption of sizable economic return: to illustrate mergers include AT&T and McCaw Cellular, USWest and Time Warner, Bell South and Prime Management; strategic alliances include Microsoft and AT&T, Cox Cable and Atlanta Journal and Constitution and Prodigy, Lotus Development Corp. and AT&T.

Meanwhile, the INTERNET, a subset of the NII, provides its users with a broad set of services: e-mail, information access to libraries, specialized databases and dialogs in many disciplines, and new and highly innovative ways to improve accessibility to information sources in the US and throughout the world. The INTERNET's growth rate - already hyperactive - seems to be accelerating more rapidly as commercial providers and users have discovered its potential and the media have decided that it is newsworthy (2300 newspaper and magazine articles about the INTERNET in first 9 months of '93 [Boston Globe, 93]). "As of May 1994, the INTERNET consist of over 31,000 networks. ... The number of computers connected through the INTERNET exceeds two million. Over 20 million people can be reached by electronic mail and have access to resources via the INTERNET" [Leiner, 1994]

The emerging NII provides interconnection today in novel ways. For example, the INTERNET may be viewed as a collection of value added services that are transported over the telephone and cable networks.

In spite of the heightened focus of government, industry, and public advocacy groups, the direction the NII will take as it moves toward its more generally shared vision is still unclear. However some assumptions for planning and analysis can be made.

Future Vision Assumptions:

Papers, books, and symposia in large numbers are currently devoted to debating what the NII will ultimately look like. Several assumptions about the NII are made for the analysis in this paper. They are:

- 1) Everyone and every organization will be interconnected.
- 2) The connections will be at a very high band width rate, greater than a billion bits per second, and sufficient to carry out interactive multi media transactions.
- 3) Cheap, high speed computation will be available as needed on the NII to facilitate the implementation of low cost coordination transactions.
- 4) A "market choice box" will serve as the interface between the consumer and the NII providing the interactive capabilities necessary to exercise free market choices in an easy intuitive way. Because of the many conflicting vendor interests in the development of the market choice box, its implementation trajectory will be uneven, and when it reaches maturity will be difficult to predict.
- 5) For purpose of this analysis we assume there will be no market access favoritism in the design of the NII. In the concluding sections of the paper we will discuss where the NII may be most susceptible to constraining market access.

TRANSACTIONS, COORDINATION COSTS, ELECTRONIC MARKETS AND VALUE CHAINS

In this section we briefly review the literature on transactions, coordination costs, and electronic markets and hierarchies, then make some observations about current growth patterns in electronic markets and hierarchies, as contrasted to anticipated growth, and finally show the effect of changing transaction patterns on selling price to the consumer for a "typical" industry value chain.

Transactions:

Economies have two basic mechanisms for coordinating the flow of materials or services through adjacent steps in the value chain: markets and hierarchies [Malone 1987, p.485; Picot 1987]. Williamson [1981, pp. 1545-1551] categorizes transactions into those that support coordination between multiple buyers and sellers, i.e., market transactions, and those that support coordination within the firm, as well as the industry value chain, i.e., hierarchy transactions.

Williamson points out that the choice of transaction will depend on a number of factors, including asset specificity, self interest of the parties to the transaction, ambiguity and uncertainty in precisely describing the transaction.

Coordination Costs:

The price for which a product is sold for consists of three elements: production costs, coordination costs, and profit margin (see Figure 2). We refer to Malone's [1987. p.485] definitions of production and coordination costs as follows:

"Production costs include the physical or other primary processes necessary to create and distribute the goods or services being produced."

"Coordination costs include the transaction (or governance) costs of all the information processing necessary to coordinate the work of people and machines that perform the primary processes. For example, coordination costs include determining the design, price quantity, delivery schedule, and similar factors for products transferred between adjacent steps on a value chain." As noted previously, firms will choose transactions that economize on coordination costs.

We note that different scholars use different terms to describe coordination costs: Chandler describes them as administrative costs, Williamson as governance or transaction costs.

We also note that as information technology continues its rapid cost performance improvement [Benjamin & Yates, 1990] that the unit cost of coordination transactions can be thought of as approaching zero, thus enabling the design of innovative coordination transactions to fit new business needs.

Electronic Markets:

Malone [1987,1989] argued that organizations increasingly coordinate their activities electronically, and that this coordination takes the form of single source electronic sales channels (one supplier and many purchasers coordinated through hierarchical transactions) or electronic markets. They also argued that electronic markets are a more efficient form of coordination for certain classes of product transactions, those where asset specificity is low [Williamson, 1981, pp. 1548], and where products are easy to describe. Thus it was argued that with

cheap coordinative transactions, interconnected networks, and easily accessible data bases, there would be a proportional shift of economic activity from single source sales channels to markets.

Underlying Principles

The arguments for a proportional shift of activity towards electronic markets are simple and straightforward.

1. Lower coordination cost favors electronic markets. Organizational forms are a balance of production and coordination costs. Organizational forms that increase economic performance will be evolutionary survivors. Markets have been characterized by low production costs and high coordination costs and hierarchies with high production costs and low coordination costs [Malone 1987, pp. 485 & Picot 1991]. As well as lowering the cost of production, information technology has and will continue to lower over all costs of coordination. Thus the lowering of coordination costs decrease the importance of the dimensions where markets have a disadvantage and will favor markets.

2. Low computing cost can expand products that favor market transactions. Products that are easy to describe favor electronic markets. Low cost computation can simplify complex product descriptions, for example, stock index funds which in the case of the NY Stock Exchange, require averaging several thousand securities daily into one easy-to-describe product.

Asset specific transactions [Malone 1987 pp.], those that favor hierarchies can be narrowed by the use of electronic technology. For example, the personal computer, on the surface a highly asset specific device (for example when adding a printer to the configuration), has been successfully sold through mail order channels by companies like Dell, Gateway and Compaq who are able to lessen product specificity with help desks, and are now installing "plug and play" configuration software to further simplify the consumer's life.

Thus more product transactions over time will favor electronic markets, and over time more purchasers will proportionately choose to purchase through electronic market makers rather than through hierarchical arrangements.

3. An evolution from single source sales channels to markets can be anticipated. Malone [1989, pp.] also suggests evolutionary paths for electronic single source sales channels and markets. Electronic single source sales channels will evolve

from separate data bases within the firm, to linked data bases between firms, (EDI), to shared data bases between firms. Electronic markets will evolve from electronic single source sales channels, to biased markets where the market maker is one of the providers and uses the market transaction mechanisms in his favor, to unbiased markets, and finally to personalized markets, where the customers can take advantage of personalized decision aids in making their choices.

4. Tradeoffs in market participation. An organization with a successful sales channel will consider setting up an electronic market when the potential profit from an increased volume of market transactions is greater than the potential loss of profit from having to sell at a lower price due to the electronic market effect. Similarly, a single source sales channel will enter an electronic market only when convinced that the total share of market transactions available to them (at prices the market will allow) is greater than the profit generated by the channel at its higher price margins.

Observed growth of electronic markets and hierarchies.

Consistent with prediction, there are many articles in the literature that describe the rapid expansion in electronic single source sales channel activities. However, contrary to prediction, comparatively little has been reported on expansion of electronic markets. There are several explanations why this is so:

1. Impact of Inter-Organizational Value Chains. Organizations readily see the opportunities afforded through electronic inter-organizational value chains in improving their competitiveness, as they focus on higher quality, increased customer satisfaction, and business reengineering. Thus they choose hierarchical arrangements rather than lower cost of market transactions with less control of the variables noted above.

One such example is electronic supply chain integration. Buyer-supplier linkages such as electronic data integration transactions produce inventory and coordination savings for large purchasers, and providers are forced to accommodate. Illustrative examples are found in retailing, where WAL-MART's supply chain [Stalk, 1992] has been cited as an example of competitive advantage, and in the relationship between auto manufacturers and their suppliers [Benjamin, 1988].

Another example is lean production. Processes that are highly coordinated to drive process and inventory time to minimums as described by Womack [1990] require tight electronic linkage between firms where asset specific relationships based on assured delivery and very high quality bias firms away from electronic market transactions, and in the direction of a small number of "partner-like" suppliers. For example, as Xerox moved to its high quality, just-in time processes it also moved its supplier base down from several thousand to several hundred. This logic is explained by Whirlpool Corporation's CEO, David Whitwam [94]: "Finally we are moving toward a significant consolidation of our suppliers. We want to have agreements that give us access to supplier technologies so that we can work together on process improvements in all of our plants. That's difficult to do with a broad supplier base."

Another example is electronic alliances. Single source sales channels such as Rosenbluth Travel have been able to expand their business through partnerships with country travel agencies where they share a common process and data base for tracking their own and each other's customers as they wend their way around the world, while providing the customer with the best costs and emergency services needed in each country [Clemons, 93]. The Rosenbluth example clearly illustrates the last evolutionary stage predicted for electronic single source sales channels, a shared data base between partners.

2. Fear of Profit Margin Deterioration. Firms are very cautious in giving up their single sales channel profit margins, until it is clear that a virtual market has been created with enough participants to force their entry. This is particularly true when a market is controlled by a relatively small number of very large corporations, where each must risk a sizable segment of market share and profit margin in an electronic market. There is evidence as in the case of the Travel Reservation System electronic markets (APOLLO, SABRE, for example) that the profits of the former sales channels, (the airlines) are drastically reduced while the profits of the market maker remain high. Even the market maker owners, American and United Airlines have given little evidence of being able to price tickets for their own airlines at a satisfactory margin.

Bakos [91] offers a theoretical analysis that the electronic market effect drives profit margin from the supplier. His study states that "in price competitive markets even a small cost of search on the buyer's part may enable sellers to

maintain prices substantially above their marginal cost: in this scenario the introduction of a market system providing price information can dramatically reduce seller profits and increase buyer welfare.” Bakos noted that this effect which is supported in economic theory, can be anticipated in undifferentiated markets (for example, commodity markets) and cited an example of Reuters, Quotron, and Telerate all establishing markets in US Government fixed income securities, which led to a large reduction in trader profits from the large bond dealers [Bakos, 1991, p.300]. He also developed mathematical models for differentiated product where price, and quality, for example are two consumer choice variables and typify the industry value chains we are concerned with . “An important implication of this analysis is that electronic market systems providing product and price information may generate substantial allocational efficiencies by enabling customers to locate suppliers that better match their needs [Bakos, 1991, p.301]”

Additional evidence is needed to further validate this phenomenon - that the consumer does very well, companies that provide the production function have much of their profit margins stripped from them, and what profits remain accrue to the market makers. This “market maker effect” suggests a world where producers may find it hard to generate sustainable profits without finding new strategies for product and service differentiation.

Observed Growth In Electronic Markets:

Despite this, electronic markets continue to expand in financial markets, as for example Charles Schwab's ONESOURCE mutual fund market. Electronic markets also are significant in commodities [Lindsay, 1990] and as previously noted in the travel industry Electronic markets also have expanded into niche markets where there are no large single sales channel suppliers with high market share to protect, such as spare parts for airplanes.

Schwab's ONESOURCE mutual fund market provides further evidence of the market maker effect. ONESOURCE [NYTIMES, 1994] has rapidly grown its equity in mutual funds \$10 billion in assets. The NYTIMES states that “For the industry as a whole, Schwab's action threatens to push down fees across the board ” The mutual fund industry sees itself as threatened by a market maker, Schwab, growing too large and being able to control a significant share of their operating margin (to illustrate, a typical no-load fund receives about .5% fee for

assets it manages for its customers. To belong to ONESOURCE they pay Schwab half of this fee (about .25 cents for each dollar of equity). The four largest no-load funds currently have in the range of \$700 billion in assets under their control. Movement of only the \$10 billion currently under Schwab control represents a \$25 million shift in operating margin to Schwab. To protect themselves, Fidelity, the largest of the no-load funds, has set up an equivalent market, and there are several smaller markets as well that no-load purchasers can buy from. Thus the market maker effect may in fact threaten the profit position of the mutual fund industry in a similar manner to what occurred with the airline reservation systems. Competitive market makers in no-load funds will possibly cause a re-distribution of operating margin in a manner more favorable to the no-load funds. Time will tell how strong the pattern of profits moving to the market maker will be in the mutual fund industry, but the financial stakes are clearly very large.

Reaching the consumer. The consumer who purchases traditionally through market oriented mechanisms such as retailers is a prime candidate for the growth of electronic markets. However electronic markets or sales channels will be unable to make significant inroads with the consumer until technology opens the door. Electronic market activity to the consumer will be highly constrained until the capabilities assumed for the NII are actualized; e.g., the home is wired with sufficient communications capability to allow interactive presentation of high quality video pictures, and the consumer has a friendly and flexible market access device available. Until then, the retailer will remain the traditional consumer market; buying and displaying merchandise from multiple suppliers for the consumer to choose. But the technologies required for the consumer are evolving rapidly, and the NII represents the organizing mechanism for reaching the consumer with these technologies.

Experience with catalogs and cable shopping channels indicates that: 1) there is a vast amount of product available that meet the criteria for electronic markets, low asset specificity, and ease of description, and 2) consumers are willing to buy these products without a retail store shopping experience. Both the rapid growth in catalog businesses and TV home shopping networks provide evidence of a readiness of consumers to shop electronically. Both of these related trends are causing retail market erosion, and illustrate how electronic markets may affect consumer markets.

Catalogs. Catalog marketers such as Lands End, cumulatively sell an enormous amount of merchandise (10,000 mail order companies sold \$51 billion dollars worth of goods through catalogs in 1992 [Brubach, 1993]). Because catalog sales must have the same characteristics as electronic markets, i.e., they must be easy to describe and not very asset specific, they indicate the wide product varieties amenable to electronic markets.

TV Home Shopping Networks. Home shopping through TV is a rapidly growing business accounting for several billion in sales in 1993. It represents a very limited form of market where the consumer is shown choices of different kinds of merchandise, but has no ability to compare merchandise within a class, thus preserving high profit margins for the channel owner. This limited market form while dictated by the current capabilities (choice, interactivity, and display quality) of the cable system, also preserves maximum price differentiation for the home shopping networks. Home shopping, however, demonstrates the consumer's willingness to buy goods over electronic channels, within the limitations described, and also identifies many products that meet the electronic market test previously described.

To summarize, expansion of electronic single source sales channels is proceeding rapidly with electronic market growth at a much less rapid pace. There seems little likelihood of this changing significantly until the consumer and the industry value chain are interconnected with capabilities such as anticipated for the NII.

Industry Value Chains:

In this section we examine how transaction patterns may change when the NII is implemented, and the effect this may have on selling price to the consumer. Figure 1 describes industry value chains that terminate with the consumer, as contrasted with intermediate goods value chains.

Figure 1A illustrates three variants of an industry value chain, and the table in Figure 1B shows the growth in value added and selling price for the first value chain. The prices presented in the figure, for high quality shirts, are derived from an article in Fortune Magazine [Thornton, 1994] and serve to present the arguments advanced in this section.

Value Chain 1. The first value chain in Figure 1 describes the traditional pattern of producer, wholesaler, retailer, and consumer. When the value added's are summed, the consumer pays \$52.72.

Value Chain 2. An alternate value chain bypasses the wholesaler and results in a price to the consumer of \$41.34. The savings to the consumer are substantial, about 28%. In reality, because the wholesaler's costs are eliminated, the retailer can eliminate some of his profit margin, further reducing his selling price, and the cost to the consumer.

Value Chain 3. Further opportunities exist when appropriate information technology can directly reach the consumer. The manufacturer can now use the NII to leap over all intermediaries. The consumer's purchase price for the shirt will be \$20.45, and the net savings is now about 62%. The manufacturer will surely try to retain a significant part of these savings, unless market forces make it impossible to do so.

An alternate scenario exists where a market maker provides the consumer access to a number of shirt manufacturers. In this case the electronic market effect should drive costs down to those of the lowest cost producer thus reducing the manufacturer's ability to appropriate a share of the value system savings. A likely outcome is a potential shrinkage in profit margins for each of the manufacturers, as discussed previously. This reduction in price will be balanced by the small profit that the market maker will make on each transaction.

A final alternative occurs when: 1) the consumer, connected to the network by interacting through what we describe later as the "market choice box", can easily access a sufficient number of single source sales channels for example, shirts, or 2) can accomplish the equivalent by making use of interactive agents [NYTIMES, 1994] to search the shirt manufacturers to come up with a shirt that satisfies his/her requirements. In each case the market maker effect may provide the consumer with a minimum price without a significant market maker transaction profit.

THE NII: AN INDUSTRY VALUE CHAIN PERSPECTIVE

In the previous section we described that when the consumer is interactively connected to the industry value chain, a value chain reconfiguration may result, with the potential for substantial economizing of transaction costs, and significant

price reductions for the consumer can take place. In this section we examine the elements of the NII relevant to our discussion and discuss several areas where industry value chain economizing opportunities can be realized.

Description of Stakeholders and Key Technology Elements:

Figure 3 describes the stakeholders of the electronic marketing/consumer process and their connectivity to the NII. Because much of electronic commerce requires both physical goods and information goods transport, the existence of the physical transportation infrastructure (rail, road, and air) is assumed but not displayed.

1. The figure shows an information highway infrastructure, that connects the following:

- Producers of information goods, including computer software, books, movies, music and the like. All of these are or have the potential to be maintained in digital form and transmitted over the NII on demand with little or no requirement for physical inventory movement.
- Producers of physical goods, including as a minimum all manufactured good categories now sold through catalogs, and additionally, those where computer technology can simplify product complexity and reduce asset specificity.
- Electronic retailers, taking numerous forms, for example, catalog merchandisers, such as such as Lands' End, specialty retailers such as BLOCKBUSTER, or multi product retailers such as Sears, Macy, and the like.
- Electronic markets. Market makers would build on existing electronic markets in the travel and financial industries, and expand into specialty niches such as shirts, personal computer software, or baseball cards.
- Physical distribution networks. Today's complex physical distribution between the components of the industry value chain and consumer may well be simplified to movement from the manufacturer to

the consumer directly, or coordinated by electronic retailer or market maker transactions. If this were to occur, the physical distribution system of the future might well resemble the process by which the catalog vendors, move their goods to the consumer, mostly through companies such as Federal Express and United Parcel Services. Where delivery times greater than same day are satisfactory, such companies are capable of providing the desired service. Where time based asset specificity requires faster movement of goods to the consumer, variants such as the ability to order the week's supermarket purchase and then drive to the supermarket depot to pick up one's order, will potentially emerge.

- Electronic channels. These are the cable, telephone and wireless and electric utility companies all of whom are capable of providing electronic access to the home. Although the variety of electronic channel choice is still limited today, market dynamics are unfolding rapidly (as for example in wireless channels) and it is difficult to predict how many channels will be directly connected to the home.
- The home, and the market choice box, where this vast amount of electronic commerce is channeled and controlled. The market choice box provides interactive access to the many markets the consumer may be interested in: entertainment, sports, shopping, libraries, education, medicine, governmental information, etc. The market choice box will evolve from the current channel selection box through a series of incremental implementations, each designed to serve a transition stage of the NII's evolution.

Figure 4 suggests that the market choice box is a server that manages the configuration of workstations, telephones, and TV's in the home, and provides the telecommunications interface to those channels that directly reach the home. We can presume that the market choice box will present the consumer a choice of markets and other activities such as entertainment, shopping, surfing on the INTERNET, or getting health information. How the primary graphical user interface (GUI) will be designed is any-one's guess, but what is important is that it not bias the consumer to one choice over another, as the initial airline reservation

systems did in terms of flight choice. Gilder [93] suggests that the ideal GUI may be the newspaper format, as it is an interface designed for human interaction that has served the test of time -- we read a headline, skip to sports, back to the financial page, advertisements catch our attention and we would like to go deeper into them, and get more information about the products. The primary GUI may also be personalizable to how we configure our life styles. The figure also suggests that each class of market choice may require a GUI ideally set up to help explore its potential.

One potential metaphor for the market choice box is Magic General's TELESCRIPT user interface [Wired, April 94, p. 107]. "The interface has evolved to a geographical depiction of a portion of cyberspace ...Those who have read Neal Stephenson's "Snow Crash" will instantly see its relationship to the Metaverse" depicted therein -- a virtual world where one can conduct all sorts of transactions, gather objects, and above all, maintain a sense of place. To buy things go Downtown and into the electronic shopping mall. To scan newspapers go the Newsstand. Eventually the local pizza shop will show up on your personal Main Street" . Such an interface would for example, let the consumer put a interactive agent into the Travel store on Main Street, that would purchase flight tickets and would act as a pseudo electronic market potentially by-passing APOLLO, SABRE and the travel agents. One might speculate that a user interface owner, such as General Magic, would like to appropriate a portion of the resultant value system and market maker savings rather than share them with the consumer.

Thus the market choice box, and the standards associated with market choice, for example (labeling of catalog items, the marketing of client and server software for products such as Telescript) can all affect openness of information and market access.

- The consumer is the wild card in this analysis. Transaction cost theory requires that an economizing transaction which satisfies both parties to the transaction take place. We have some evidence as discussed previously (catalog and TV shopping networks) that the

consumer will choose alternate forms of transactions to retail store transactions, in favor of price, high quality, selection choice, and savings in personal life style wear and tear.

An Office of Technology Assessment's Study, [1994, pp. 30-31] describes a consumer purchase from a transaction cost perspective. "Consider markets in the context of a consumer buying a high end-stereo system. The buyer mulls over the features that are most important -- wattage, audio performance, appearance, size, speakers, CD player, tape deck, and cost. There may be hundreds of dealers to choose from. The consumer reads catalogs, compares specifications, consults Consumer Reports, calls for price information and visits dealers to compare models and prices. The search can take hours, days or weeks. The time spent in research, comparative shopping, and making the deal are the transaction costs, as are the expense for fuel, wear and tear on the automobile {as well as the psyche ..author's comment}, magazine and catalog purchases, and telephone charges".

The potential changes in consumer behavior as he takes advantage of transaction cost opportunities made possible by the NII, are on such a large scale, and the electronic transaction capabilities currently afforded the consumer are in such rudimentary form, that our understanding of what the consumer will do is at best cloudy.

Tennenhouse [1994] suggests a 3 tiered evolution of the NII to a model consisting of multiple electronic channel connections to the home, connected to electronic switch and brokerage services, and to application and products available on the NII. His model is consistent with the evolution of the electronic market to the consumer described in this paper.

Value Chain Opportunities:

Based on the above analysis we summarize four areas of opportunity to economize on industry value chains that reach the consumer electronically.

1. Benefits to the consumer. The consumer will have free market access to all suppliers who are willing to pay one of several interconnection costs to reach the consumer: single channel suppliers such as Lands End, electronic retailers such as Macy's may become electronic market makers. The consumer will gain

maximum choice and the ability to buy at a lower market price than today. If and when “interactive agents” have demonstrated their feasibility, the consumer may have access to a market price without market maker profits attached, but with the more efficient level of market pricing from the single channel suppliers.

2. Lower coordination costs throughout the industry value chain. Electronically linked producers and retailers will be able to lower their costs by reducing intermediary transactions and unneeded coordination via electronic transactions directly with the consumer.

3. Lower physical distribution costs. Physical distribution costs will be minimized in two ways. First, information products will be transmitted electronically and much lower cost electronic distribution costs will be substituted. Second, as each element of the industry value chain is bypassed, a necessary physical distribution link and related inventory carrying costs is eliminated (see Figure 1, value chains 2 &3).

4. Profit within the industry value chain will be redistributed and potentially reduced in total as the value chain is economized. The lessons of the airline reservation systems, the initial behavior of Schwab’s ONESOURCE, and market economics are compelling reasons to believe that difficult transitions for many companies will need to be confronted.

MANAGERIAL AND POLICY CONSIDERATIONS

Finally, in summary, we examine managerial and policy considerations from two points of view: freedom of market access, and potential for value chain reconfiguration.

Market Access Considerations:

Because of the vast amount of economic activity that will take place over the NII when fully implemented, policy makers need to consider those areas where market access may be restricted.

Figure 5 suggests three areas of concern where market access on the NII could be restricted. They are: electronic market owners, electronic channel owners, and the market choice box. The first two have parallels in previous infrastructure policy, and have been widely discussed in papers, congressional testimony,

symposia, etc. The market choice box has not been the subject of any significant discussion. These areas of concern are considered below:

The Electronic Market. If the market maker owns or has a substantial interest in any of suppliers, he can bias the market in their favor, and both the consumer and other suppliers will be disadvantaged. The airline reservation systems where this was a common tactic by the airline market maker were stopped from continuing this practice [Copeland, 1988]

Electronic Channels. If the owner of a physical communication channel such as TCI, one of the long distance carriers, or one of the regional telephone companies restricts access to any market channel because of interest in specific other market channels, it restricts free access to the consumer. The potential, but dissolved, TCI - Bell Atlantic merger posed such a threat, as both own electronic channels into the home, and TCI had substantive interest in market suppliers of entertainment programming and home shopping. They thus could restrict access to producers, retailers, and market makers to suit their own economic interests. Additionally, the channel owner who also has a monopoly on information access to the consumer can also keep cost of access unnaturally high, and the rate of technology advancement may be curtailed, as when AT&T maintained a total monopoly in telecommunications.

Regardless of how many channels end up being connected to the home, for the electronic market effect to take place, those channels must not limit or fully control access to the home for the providers of products or services dependent upon reaching the home.

The Market Choice Box. The market choice box can inhibit access to/for the consumer architecturally. It is not at all clear that the hardware processor, operating system, or other architectures that have won dominance out of the PC evolution will maintain that dominance in the NII world. The computing capabilities and innovation required in an operating system and user interfaces for the interactive multi-media world may result in a new set of dominant architectures. Dominant architectures, such as IBM's in the 1960's through early 1980's and now Intel and Microsoft today, have demonstrated the economic benefits of ownership of architecture most clearly. However these architectures were limited in their revenue potential to the information industry, whereas the

architectures that may control electronic transactions on the NII may have the ability to tap a vastly larger revenue stream of retail transactions to the consumer. Openness then becomes not only desirable but essential. However we need to understand what openness means in terms of the market choice box.

Consider a market choice box that comes with a client user interface (such as General Magic's TELESRIPT discussed previously) that because of ease of use and value to the consumer becomes the dominant user interface. It can constrain free access in the following ways: 1) by not providing standards for other vendors to produce TELESRIPT standard active agents, thus restricting consumer market choice to the areas where they choose to produce active agents; 2) by selectively controlling what consumer product suppliers they will license server software for search and completion of market transactions; 3) by not licensing standards for other vendors to produce server software capable of handling their active agents.; and 4) by using market power to ensure that all market choice boxes come equipped with their user interface. The reader should understand we have little knowledge of General Magic's product capabilities and market intent. They are useful in this analysis, as they represent the first reasonable illustration of a potential product for the market choice box that could both enable the consumer to access market choice, and could also restrict access in significant ways.

To summarize, stakeholders in the NII evolution need to think about the consequences of market constraint, and what legislative and other policy is needed to ensure a fair playing field. Further, stakeholders such as most manufacturers of consumer products, have as much of a stake in this evolution as do the telecommunications and information technology companies.

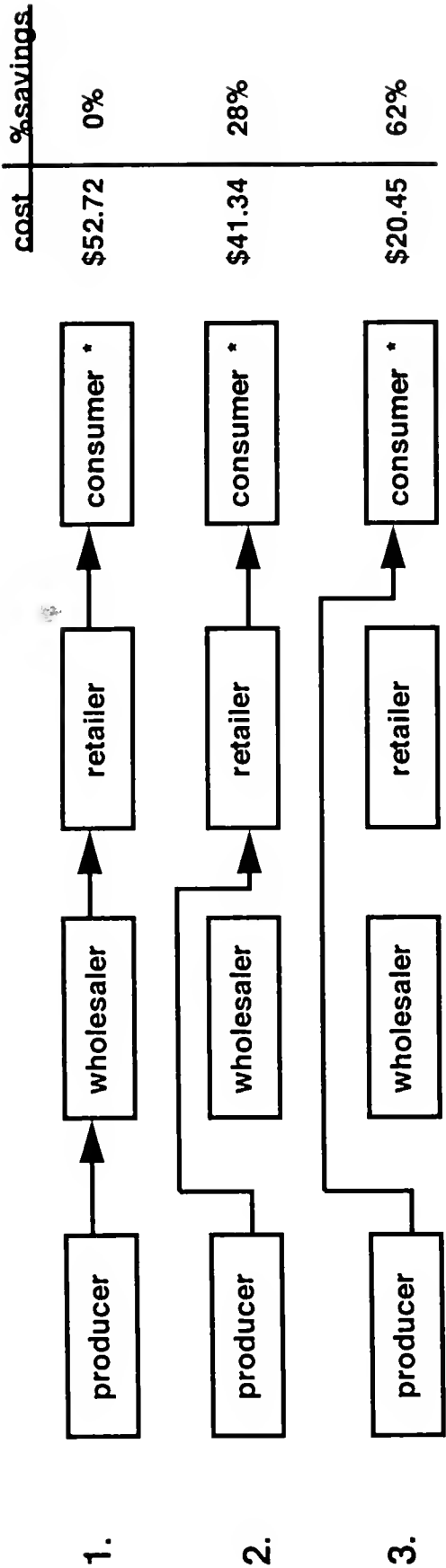
Business Reconfiguration Considerations:

All the stakeholders in the industry value chain that reaches the consumer have to rethink their role in the electronic commerce world that will evolve with the NII. They must consider whether their place in the value chain is threatened, and if so, what long-term strategies make good sense to experiment with. Those in the consumer value chain will need to understand under what conditions the consumer will prefer to purchase from single source suppliers, brokered electronic markets, and intelligent agent proxies for electronic markets.

To do so, they must learn how to use the NII in its current rudimentary form, and as it transitions to greater capabilities begin to more actively test their strategies. They need to decide what technologies are crucial for their objectives and follow how they mature closely. Finally they need to carefully follow electronic market implementation to learn how the market-maker effect will redistribute profit margins.

Figure 1. Industry Value Added Chains

A. Alternate Value Added Chains



B. Value Added and Selling Price (shirts)

stakeholder	producer	wholesaler	retailer	consumer *
value added	\$20.45	\$11.36	\$20.91	
selling price	\$20.45	\$31.81	\$52.72	\$52.72

* Consumer transaction costs are not considered

Figure 2. Components of Selling Price

Profit Margin
Coordination Costs (buyer and seller)
Production Costs

Figure 3. Stakeholders in Electronic Market to Home

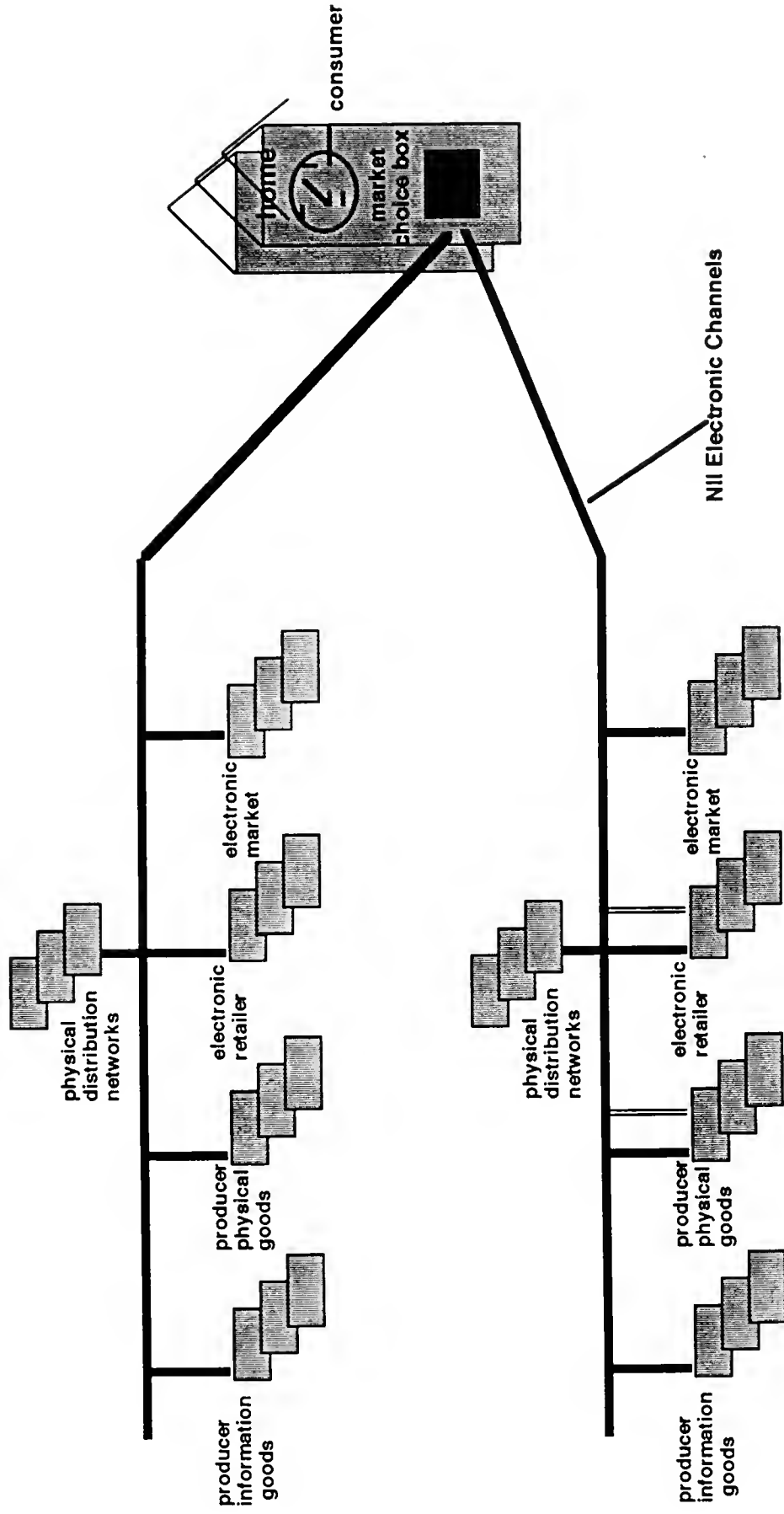


Figure 4. Market Choice Box

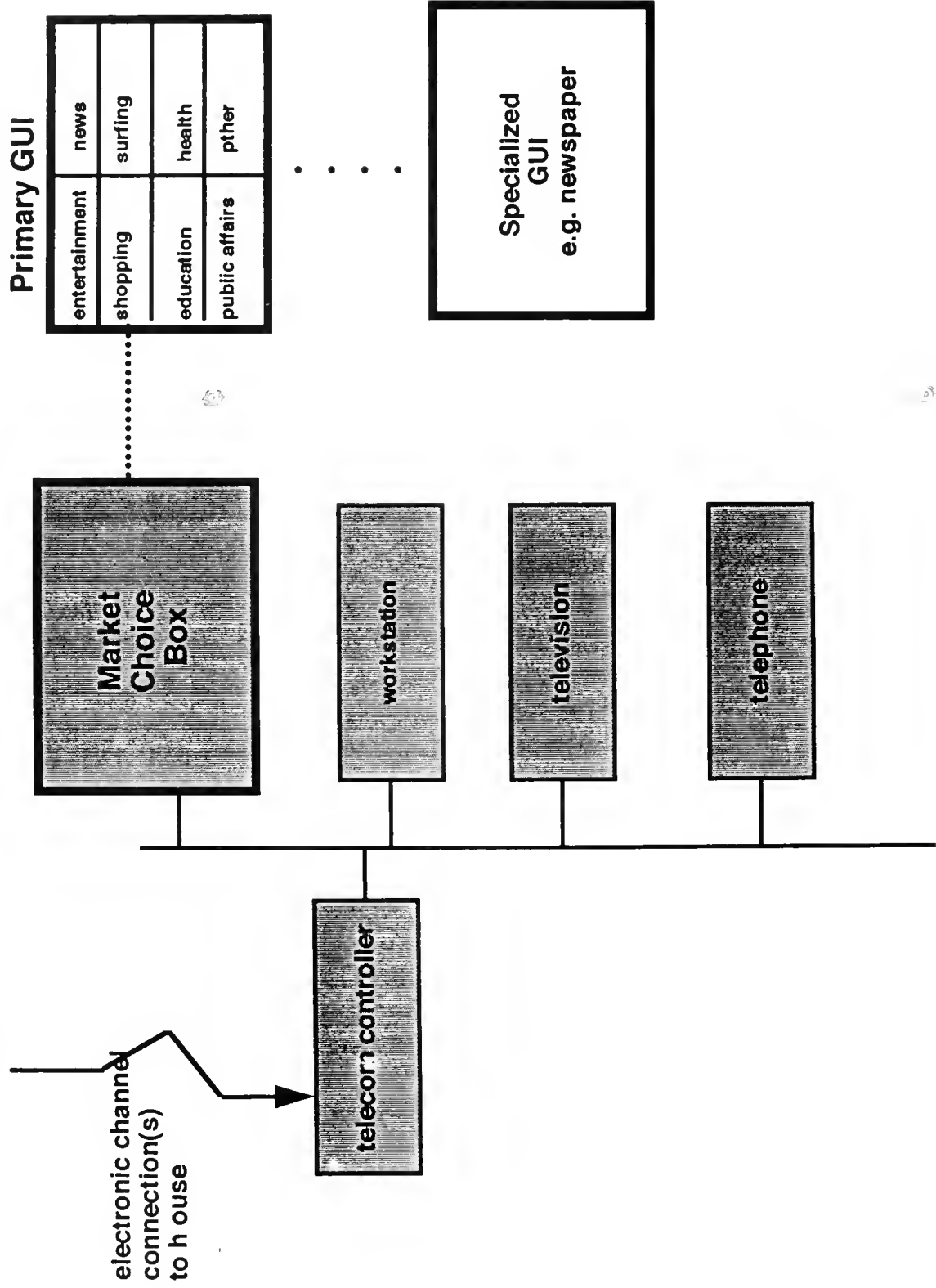
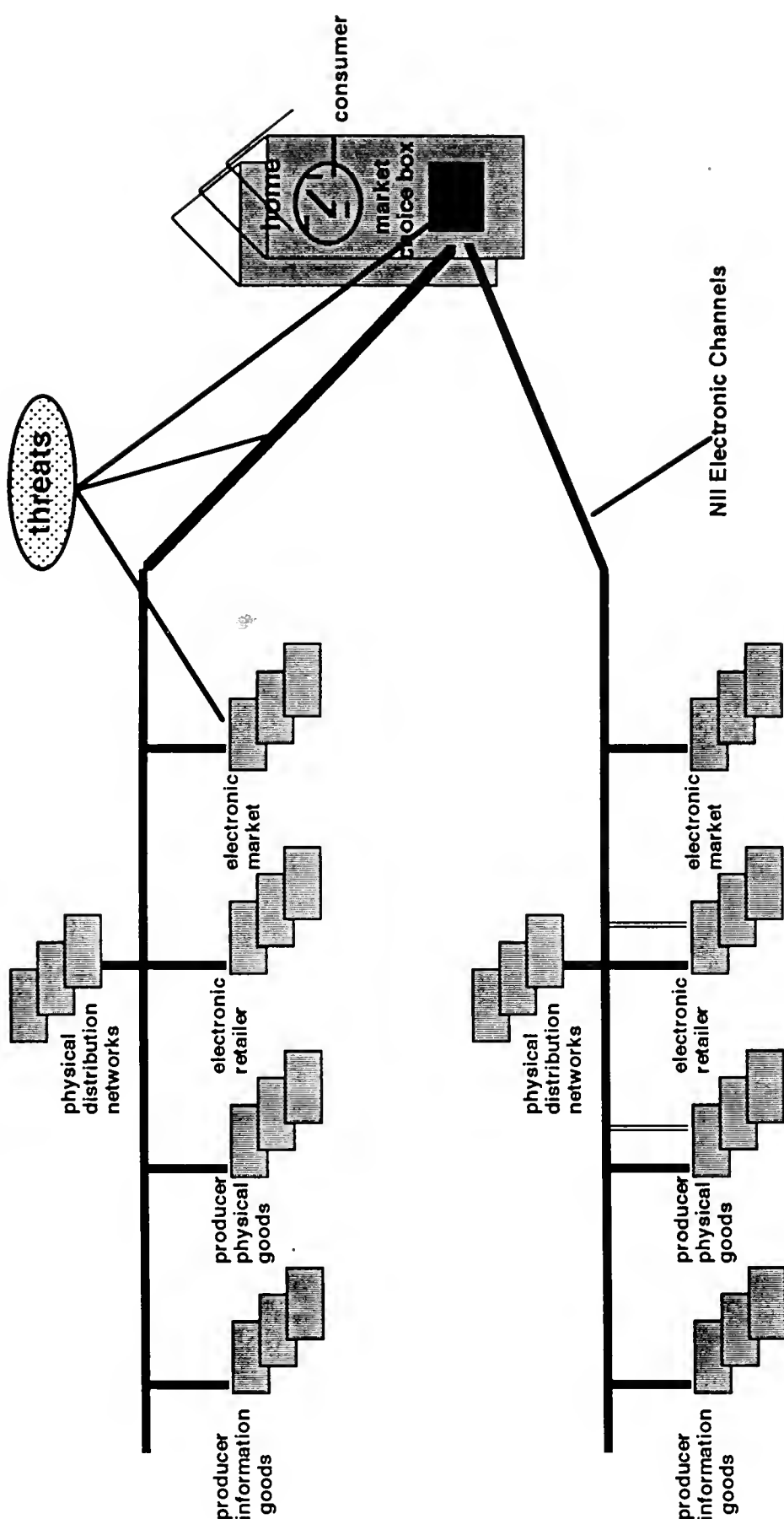


Figure 5. Threats to Market Access



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